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(56) Documents cited  
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(54) Reinforced articles

(57) The present invention relates to methods for reinforcing articles formed from sheet materials such as plastics and fibreglass materials. Essentially the reinforcing method comprises forming reinforcing projections 4, which extend out from the surface of the sheet material, by pinching together two adjacent areas 5,6 of the sheet material 1 between gaps 3 of movable moulds 2, attaching these two adjacent areas to each other by known means such as with adhesives or by chemical bonding. Conventionally sheet materials are reinforced by attaching separate projecting ribs or reinforcements to the sheet material whereas in the present invention the reinforcement is formed from the sheet material itself and forms an integral part of the sheet material. The present invention is particularly useful for use in sheet materials used in the building industry e.g. in the cladding of buildings, walls of buildings, curtain walling and roofs.

Strips of metal may be inserted between or on either side of areas 5,6 as additional reinforcements.

Fig.1.

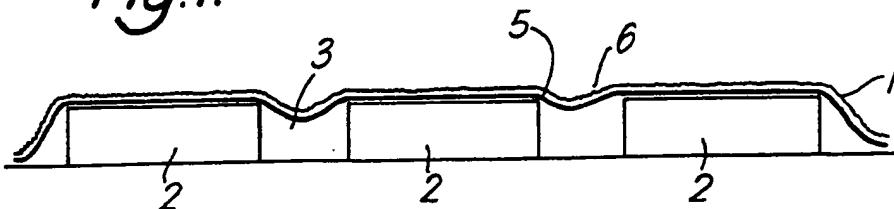
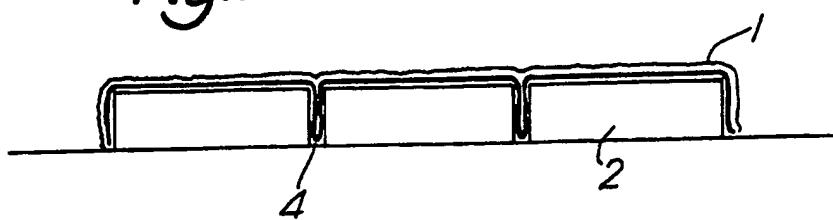
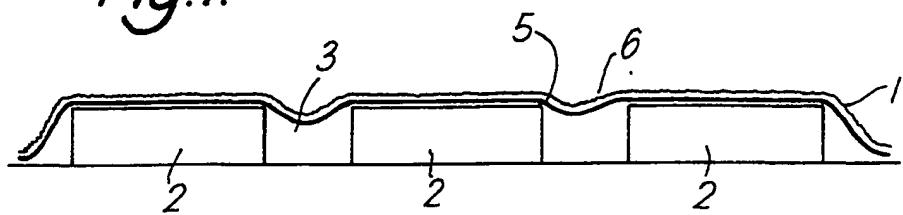


Fig.2.

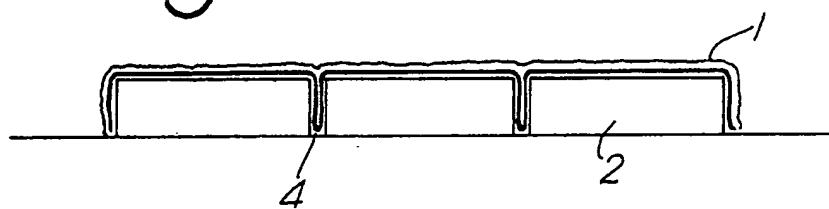


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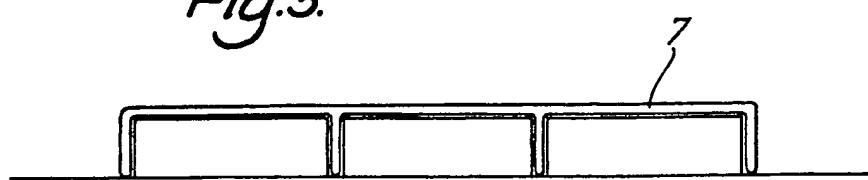
*Fig.1.*



*Fig.2.*

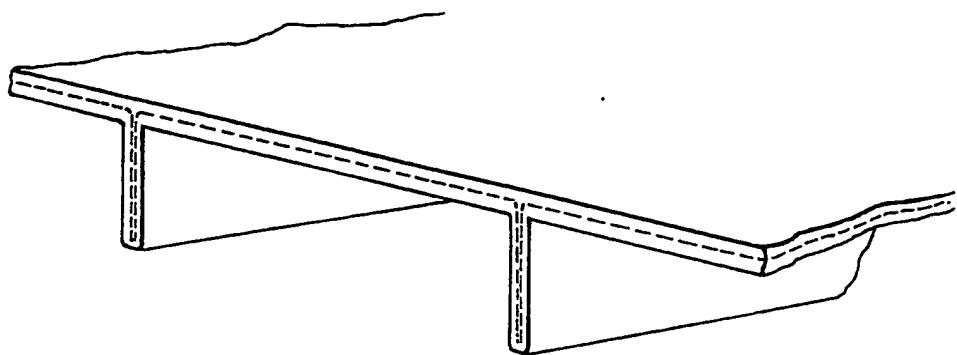


*Fig.3.*

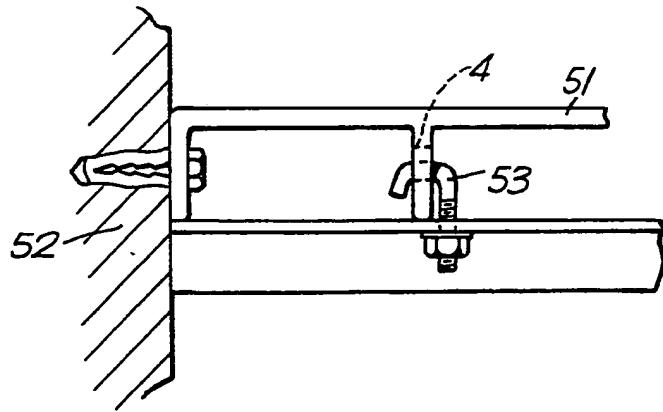


2/2

*Fig. 4.*



*Fig. 5.*



NOVEL REINFORCEMENT OF ARTICLES

This invention relates to novel methods for forming reinforced articles and novel reinforced articles per se and relates in particular to novel methods for producing reinforcing projections in sheet materials and in particular in glass reinforced plastic, and to novel products comprising sheet materials, particularly glass reinforced plastic, which are reinforced with integral projections.

Articles, particularly of sheets of glass reinforced plastic, will often break or crack or fail or flex severely if a load is applied across, or to one point, of a flat surface of that article.

Conventionally, reinforcement of articles and in particular of sheet materials formed from glass reinforced plastic has been achieved by either incorporating a different material e.g. metal into the structure to act as a reinforcement or by attaching, by various means such as adhesives, bolts etc, external reinforcing ribs made from a wide range of materials such as metal and glass reinforced plastics. In the latter method for example, ribs of glass reinforced plastics are attached to a preformed sheet of glass reinforced plastic, by gluing or laminating it to that sheet, in order to reinforce and strengthen the sheet and thus prevent it from bending or failing if a load is applied to a flat surface of said article. It will be appreciated that whilst articles reinforced using known methods may offer a satisfactory performance they are difficult, costly and time consuming to manufacture since their manufacture involves a number of different, separate steps. In addition the additional lamination or attachment of the reinforcing member, if not done correctly, can cause the reinforced article to fail when subjected to a load.

It is an object of the present invention to mitigate or overcome some of the problems associated with the known methods of reinforcing articles and of known reinforced articles.

According to the present invention there is provided a method of reinforcing articles formed from sheet materials wherein a reinforcing projection to the article is formed by opposing at least two areas of the said sheet material with each other and attaching said opposed areas to each other so that said reinforcing projection extends out from a surface of said article.

According to a further aspect of the present invention there is provided a novel reinforced article formed from sheet materials wherein said article has at least one reinforcing projection extending from a surface of said article, said reinforcing projection being formed from at least two opposed areas of said sheet material being attached to each other.

By projection is meant any shape which extends beyond a surface of the article in question. Preferably the projection will be in the form of a rib extending approximately perpendicularly to a surface of an article although it will be appreciated that projections in other shapes and forms can be used. Such projections can be, for example, continuous or discontinuous.

By opposing is meant taking two areas, preferably adjacent areas, of a sheet of material and placing them opposite each other so that they can be attached to each other.

Preferably the attachment of two opposed areas of sheet material is by bonding, preferably as a result of the sheet material setting into a rigid form from a previously non-rigid form and in the process bonding the two opposed areas into a homogeneous projection. It will be appreciated that other known forms of attachment e.g. gluing, bolts etc can be used alternatively or in addition to this bonding.

Preferably the sheet materials used in the present invention are materials which are initially in a non-rigid form but which adopt a rigid form as a result of some change e.g. chemical reaction during the process of forming an article.

Suitable sheet materials include for example glass reinforced plastic, (comprising glass fibre in a resin) where the opposed areas are bonded together as the resin sets. Sheets of thermoplastic materials e.g. metals, plastics, where the opposed areas could be melted together by the application of heat. It will be appreciated from this that a wide variety of sheet materials can be used. Furthermore it will be appreciated that whilst it is preferable to use relatively flat uniform sheet materials it is possible to use, in the present invention, sheet materials that only have a small flat area, where the reinforcing projections are to be placed, whereas the rest of the sheet material may not be flat e.g. it may have raised surface features, or have a complex shape away from the relatively flat areas where the reinforcing projections are formed.

The two areas of the sheet material to be opposed to form the reinforcing projection can be brought together by any known means including manual and mechanical means.

It will also be appreciated that further reinforcing materials including for example strips of metal etc can be inserted preferably between, or less preferably on either side, of the two opposed areas thus further strengthening the reinforcing projection.

Typical articles produced using the present invention include for example sheets of glass reinforced plastics which can be used as building materials in the construction industry.

An example of both a process and a product of the present invention will now be described by way of reference only and without limitation to the scope of the present invention.

Referring now to the accompanying drawings Figures 1 to 3 represent a diagrammatic scheme of a novel process of the present invention. The detailed process of making articles from sheet materials, including glass reinforced plastics, are well known to those skilled in the art and thus only the novel parts of those processes relevant to the present

invention will be described herein. Figure 4 shows an end view of a novel product of the present invention and Figure 5 shows a view of a novel product of the present invention in use.

Reverting now to Figures 1 and 2 these show a sheet material 1, in this case glass reinforced plastic i.e. glass fibre in a resin in a non-rigid i.e. unset state, draped over a number of formers or moulds 2 set at preset intervals and covered with a release film (not shown). There are gaps 3 between the moulds. In the novel process of forming reinforcing projections, see Figure 2, the sheet material 1 covering the gaps 3 is forced into the gaps 3 thus forming reinforcing projections 4 (in this case ribs) from the two opposed areas 5,6 of the sheet material, The moulds 2 are pushed together, manually in this case, thus reducing the gaps 3 and forcing the opposed areas 5,6 into close contact. As the glass reinforced plastic cures and sets the two opposed areas 5,6 are bonded together to form, in this case, a homogeneous reinforcing projection after which the moulds can be removed, Figure 3. The spaces left between the reinforcing projections 4 can, if desired, be filled with other materials e.g. expanded polystyrene. Equally a further layer of material can be laid onto and attached to the top surface 7 of the finished articles. This further layer could be another layer of glass reinforced plastic for example.

Referring now to Figure 4 this shows an article 41, having a reinforcing projection 4 formed from two opposed areas of a sheet material 1.

Referring now to Figure 5 this shows a typical application of a product of the present invention. In this case wall cladding 51, having reinforcing projections 4, in this case having a metal, i.e. steel, reinforcement (not shown) between the two opposed areas of the original sheet material is attached to the structure of a building 52 by means of bolts 53 inserted through the reinforcing projection 4.

Similarly, for example, other building materials such as walls, roofs, roof lights, curtain walling, suspended

ceilings and security screens can be made which are both rigid, strong and easy to make, using the novel processes and products described above. Furthermore the inclusion of a homogeneous reinforcing projection as hereinbefore described gives a reinforcement that is stronger than an equivalent reinforcing projection which is attached to an article after that article has been made.

CLAIMS

1. A method of reinforcing articles formed from sheet materials wherein a reinforcing projection to the article is formed by opposing at least two areas of said sheet material with each other and attaching said opposed areas to each other so that said reinforcement projection extends from a surface of said article.

2. A method according to claim 1 wherein the two areas opposed with each other are brought together between two moulds.

3. A method according to any of the preceding claims wherein two opposed areas are attached to each other by chemical bonding.

4. A method as claimed in either claim 1 or claim 2 wherein the two opposed areas are attached to each other by adhesives.

5. A method as claimed in any of the preceding claims wherein a further reinforcing material is interposed between the two opposed areas of the said sheet material.

6. A method as claimed in any of the preceding claims wherein the sheet material is in a non-rigid form prior to two opposed areas being attached to each other but in a rigid form thereafter.

7. A novel reinforced article formed using a method as claimed in any of the preceding claims.

8. A novel reinforced article formed from sheet materials wherein said article has at least one reinforcing projection extending from a surface of said article, said reinforcing projection being formed from at least two opposed areas of said sheet material being attached to each other.

9. A novel reinforced article as claimed in claim 7 or 8 wherein said article is made from a glass reinforced plastic material.

10. A novel reinforced article as claimed in any of claims 8 or 9 wherein the attachment is by chemical bonding.

11. A novel reinforced article as claimed in any of claims 8, 9 or 10 wherein a further reinforcing material is inserted between the two opposed areas.

12. A novel reinforced article as claimed in any of claims 7, 8, 9, 10 or 11 wherein the said reinforcing projection is continuous.

13. A novel reinforced article as claimed in any of claims 7, 8, 9, 10 or 11 wherein the said reinforcing projection is discontinuous.

14. A novel reinforced article as claimed in any of claims 7, 8, 9, 10, 11, 12 or 13 wherein a further reinforcing material is placed on either side of a reinforcing projection.

15. A method of producing reinforcing articles as described herein and with particular reference to the accompanying drawings and example.

16. A novel reinforced article as described herein and with reference to the accompanying drawings 1, 2, 3 or 4.